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DRIVERS AND BARRIERS TO SUSTAINABLE AVIATION, EXAMPLE OF AIRBALTIC

Bachelor Thesis

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This paper conforms to the requirements for a Bachelor Thesis

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I have written this Bachelor thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced

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Introduction

Over the last century the aviation industry has experienced significant levels of growth. Like many industries, it has attempted to keep up with the ongoing technological advances that the changing environment needs. Globally, the aviation industry contributes 3.6% of gross domestic product and has a 2.7 trillion share in the world economic activity. Europe accounts for 26% of all air traffic. (ATAG, 2018)

Air traffic is well connected with the ongoing improvements in infrastructure and the need for efficient transportation networks (Braun, 2019). While the aviation industry has been around for over a century, it is still experiencing moderate growth. According to the Aviation Industry Leaders Report, there is a forecasted 5.5% passenger travel growth for the next 10 years (Tozer-Pennington, 2019).

Even with all the aforementioned benefits, there is also an opposing level of detriment: The strain of this industry has impacted the environment detrimentally and we are still in the early stages of attempting to mitigate the levels of emissions which have been created.

In an attempt to understand the ways in which the environment is affected and what can be done within the aviation industry, this paper highlights and systemically analyzes drivers and barriers which are deemed to be a very large influence (both positively and negatively) on the environment. By understanding these drivers and barriers, we have the foundational pillars required to refine and improve these drivers and reduce the level of influence the barriers have. This will ultimately lead to a cleaner aviation industry and environment overall.

One airline, airBaltic can be used effectively as a lens in order to understand these drivers and barriers. This airline was chosen as it provides unique insight not provided by other airlines: Their public focus on sustainability. For example, airBaltic has been going through a drastic fleet change not usually seen within the airline industry.

The key drivers which are discussed in this paper include those of a political, economical and social nature. For example international policy changes by governments around the world have changed in recent times further tightening environmental regulations, thus challenging the 'environmental freedom' airlines have.

People's awareness of how humanity is detrimentally impacting the environment has risen, and action is being taken. The importance of moving into the future with the ongoing growth of having minimal damage to the environment is significant and so once again, understanding these drivers and barriers is paramount.

On the other hand, barriers include the increased costs in being environmentally friendly, lack of innovation within the sector, and the inability for airlines to focus on long term gains rather than short ones. All these points regarding the drivers and barriers are further discussed in later sections.

In airBaltic's case, over the course of several years, the airline has gradually transitioned their fleet from using Boeing 737 and Dash-8 aircraft to Airbus aircraft by stating this as a move towards sustainability. In this case, airBaltic has been chosen due to the practicalities of obtaining accessible and direct information from various sources within the airline.

To achieve the aim of the research, the following tasks are set up:

- Provide a theoretical framework for the essence of sustainable practices within aviation.

- Give an overview of drivers and barriers to sustainable practices implementation in aviation based on literature.
- Calculate effects on emissions of fleet change in airBaltic as an example of sustainable practice and economic benefit.
- Conduct interviews to discover drivers and barriers for implementation of sustainable practices, as well as further explore sustainability within airBaltic.

The structure of the paper includes theoretical and empirical sections. The first part of this work focuses on explaining sustainability in aviation and provides examples of it. Previously done studies are also compared to conclude the drivers and barriers within airlines. The empirical part of this paper includes a section which shows an accurate estimate of the emission reduction due to the sustainability approach airBaltic has taken. This section further determines the drivers and barriers, as well as the sustainable practices within the airline based on interviews with experts from different specialties in airBaltic.

KEYWORDS: Sustainability, sustainable aviation, emissions, environmental impact

1. Theoretical background for sustainable aviation practices and their impact

1.1. The definition and drivers of sustainable practices

As the environmental awareness of companies is increasing, their future orientation is not solely based on economic variables. Nowadays, environmental impact has become a serious concern. New strategies and plans are implemented to enable continued rapid growth while leaving minimal negative effects. By doing so, companies are able to rebrand themselves as sustainable. Sustainability has multiple definitions (see Figure 1), but every one of them has a common ground - actions done now cannot disregard the future any longer.

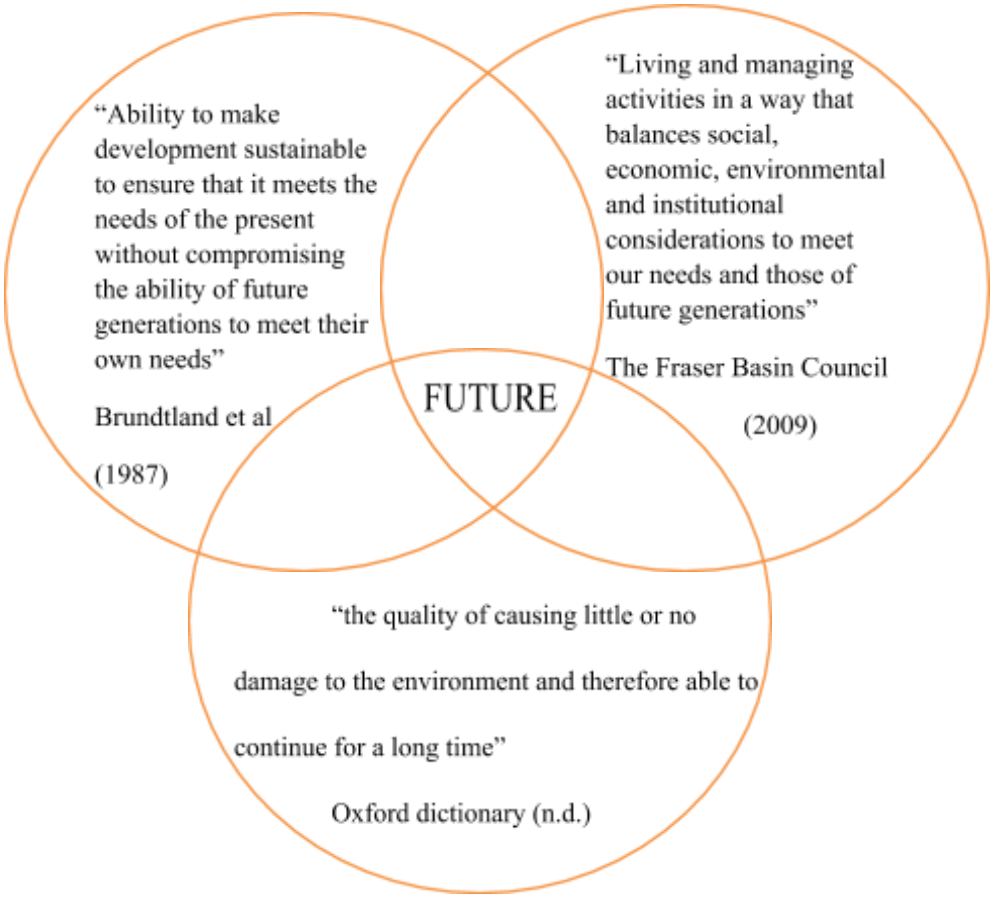

Figure 1

Sustainability definitions

Source: compiled by author based on the definitions by Brundtland et al (1987), Fraser Basin Council (2009) and Oxford dictionary (n.d.).

These three explanations to one single word can only further emphasize how important it is to be forward-thinking. As various sources have used the most common definition, The Our Common Future report by Bruntdland et al (1987) identified sustainability as the responsibility of change that needs to be acted upon now. Things cannot be done disregarding the future and the impact it will have on it. Companies have become more forward-looking over the years, shareholders are no longer interested nor capable of relying on short term solutions which is considered one of the barriers.

The status-quo implies that consumers want their products and services produced and redistributed without harming the environment. Faser Basin Council (2009) takes into account not only environmental effects, but also social, economic, and institutional effects that have to be equally important for the present and future generation. This highlights the variables that influence the companies to become more forward-thinking, not only financially, but also in the social requirements of the target market that have to be matched with a company's core operations and strategy.

Even the laymen definition aligns with the more scientific ones, emphasizing the need for minimal consequences and damage to the environment in order to move forward.

Aviation is a growing sector, therefore, its effect on the environment has been increasing. Policies are changing in various ways which focus on a number of issues. These issues include, climate change, aircraft noise, and local air quality, as well as many other issues which are connected within the aviation industry (Aviation and Environment n.d.). Because of this, it is understandable that airlines within the aviation industry have an interest in partaking in being eco-friendly. Arguably, one of the greatest threats to our planet is our modern usage of transportation. Transportation accounted for 28% of global energy demand

and 23% of global energy-related CO2 emissions in 2014 - Aviation contributes to 13.3% of that (IPCC 2018). As the growth has continued, consequently, the level of emissions have more than doubled in the past 30 years (EEA, 2018). Aviation emissions are connected directly with the distance an aircraft flies and in 2017 the length of kilometers flown by commercial flights has increased by 60% over the last 15 years to 1.643 billion (EASA, EEA, EUROCONTROL 2019).

Even with innovations and more policies being implemented, the emissions have been increasing since 2014. Aviation contributes to 3.6% of the total EU28 emissions, but with the growing demand, these indicators will follow the growth. (Climate change n.d.) The biggest environmental concern regarding aviation are the emissions produced. CO_2 is directly produced from the burning fuel concentrating in the atmosphere. NO_X is the other contributor to emissions that is produced in the higher altitudes, cruise. These two variables are accountable for 2-3% of the yearly global CO_2 emissions. (Aviation Environmental Impacts n.d.)

As the business environment is changing due to outside pressure, companies are making the choice to become sustainable. A study done by Melkonyan, Gottschalk and Kamath (2017) highlighted that sustainability has become one of the priorities when it comes to changes in business models. Business operations are influencing the environment and vice versa, therefore while developing a business model, influence of climate change should be taken into account. With their research they concluded that growth of new customers and increased company reputation was due to the sustainable practices that impacted the sales. Customers are arguably key to every successful business, so it is important to understand the effect additional shareholders (such as investors and consumers) have contributed to the sustainability trend. As sometimes the process is costly, the reasons for change have to have

high importance and be relevant. Outside influence is indeed affecting companies. The ongoing trend regarding climate change is made more and more popular across the world. Inspirational activists around the world are addressing the world's leaders as well as industry leaders to help fight climate change and make an improvement for a better future. In turn, social media and journalists are raising awareness and waiting for answers and solutions. For example, activist Greta Thunberg introduced the so-called “flight-shaming” which led to people choosing other forms of transportation rather than flying and consequently resulted in the decrease of air travel (Vaughan 2019). Companies feel pressure to introduce ways in which they can portray themselves as environmentally sustainable.

To reduce the negative effects aviation has on the environment, companies around the world are contributing to sustainability in multiple ways. Depending on the industry and the size itself, companies are making changes in their structure - Starting from voluntary commercial offsetting schemes to biofuel and even drastically changing their core components which in our case is the change in an airline’s fleet (Environmental sustainability for aviation 2018).

Fleet change is a drastic change in regards to sustainability as it is very costly. airBaltic has chosen to have sale and leaseback transactions to finance this change (Annual Report 2019, 2019). Sale and leaseback transactions occur when “an asset that is previously owned by the seller is sold to someone else and then leased back to the first owner for a long duration” (Tardi 2020). By using lease as a way to acquire new aircrafts in order to transform the fleet, airBaltic is able to avoid the lump payment of approximately 85 million per aircraft (Airbus A220-300 n.d.). The evidence of fleet change being costly is undeniable, but sustainable implementations in the long term prove to have lower operation costs (Melkonyan, Gottschalk and Kamath 2017).

Eco-friendly, sustainable products are known to be costly so airlines are attempting to find a balance between the economic downfalls and environmental benefits. Ultimately, there are several aspects that need to be taken into account before a company is able to move into a more sustainable direction.

Some companies choose a different way. They start off small, but decisively. For example, Delta Air Lines have invested over 2 million in carbon offsets by developing a weather app which helps pilots burn less fuel. American Airlines are investing in new aircraft and reducing emissions by installing paperless cabins. KLM has responsible waste management and material recycling. United Airlines are investing in sustainable fuel sources. American Airlines who have made improvements on their aircrafts to reduce emissions. KLM has drastically reduced the use of plastic during the in-flights service. One start-up offers passengers the option to pay additional money by taxing the emission amount their flight will produce. This money then goes to an NGO that specializes in educating people about the problem and funding projects about climate. (The Most Eco-Friendly Airlines For Environmentally Conscious Travellers n.d.). In addition to previously mentioned solutions, sustainable fuels, policy implementations, and improved air traffic management are tools which are being used to help deal with aviation's contribution to a cleaner environment (EEA, 2018). A lot of airlines have already taken part in the green movement and a lot are bound to do so in the near future.

Having concrete certifications which would prove the airline is sustainable, is not that common (mostly due to the fact that the term sustainability is a wide concept and many authors understand it differently), companies chose different ways to portray this. By analyzing different literature and airline's websites, it is most common for airlines to release

press releases and add special sections to portray the sustainability practices within the company.

On a more general level, some solutions which could improve green initiatives involve greater efficiency in flight routing therefore reducing fuel. Another could be decreasing the demand in short-haul flights (up to 400km) by providing passengers with high speed trains. In the future, some innovations could help with reducing the fuel usage while on the ground by switching to electricity, meaning, using electricity for all the on ground operations rather than burning fuel and producing emissions. (Teter, Le Feuvre, Gorner, Scheffer 2019)

Solutions to becoming more sustainable differs depending on many factors. A significant number of companies are implementing sustainability in their daily operations. There are many ways to become more sustainable (see Figure 2) and whichever approach is chosen depends solely on the company. Some companies start with small steps, such as waste management, investing into sustainable fuel options and other approaches as mentioned before. Some companies are choosing more costly options but they are doing so because the long-term environmental and economic benefits are desirable enough. When looking into the future, the changes are more advanced and sophisticated because the pace of innovation is desirable for it.

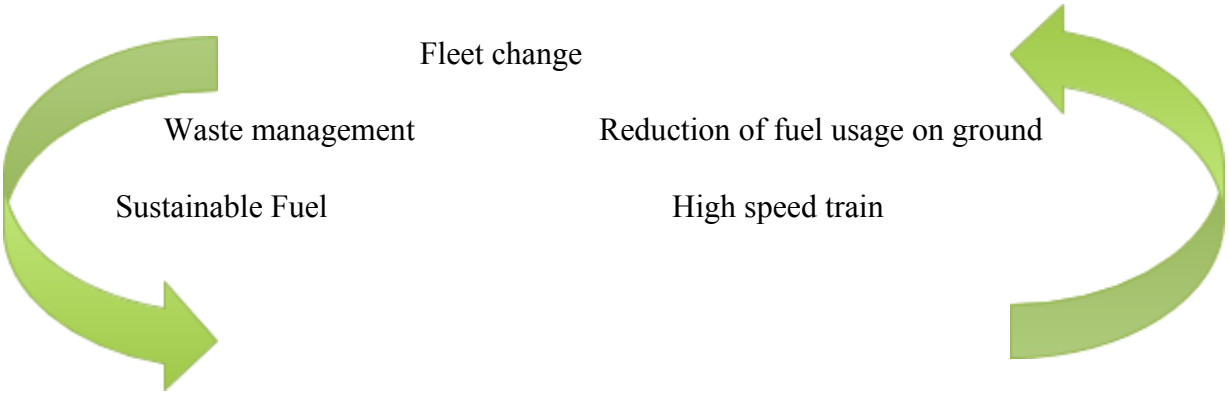

Figure 2

Sustainable approaches in aviation

Source: Compiled by author based on Teter, Le Feuvre, Gorner, Scheffer (2019), The Most Eco-Friendly Airlines For Environmentally Conscious Travellers (n.d)

Sustainability is becoming a more popular and crucial subject when it comes to aviation. There are different factors that help companies to become more sustainable and there are those that are stopping the change. Further analysis of this is needed to understand the main variables when it comes to sustainability.

1.2. Overview of previous studies of drivers and barriers of implementing sustainable practices in aviation

To better understand what has been done before, analysis of previously done studies is required. As fleet change is a unique approach in order to become more sustainable, mostly due to the costs, finding exact studies connected with this was rather difficult. Therefore, the research was connected with finding studies of different sustainable approaches and the reasoning behind it. The studies were found through the scientific databases, such as, EBSCO and ScienceDirect. Studies were picked out by choosing a specific keyword, in this case "sustainability within airlines", concentrating on drivers and barriers, as well as possible solutions to becoming more sustainable. It was further narrowed down to studies depending on the year of publication. The newer the study, the more relevant it is in our case, as well as how good it fits with this thesis' aims and tasks.

There are different ways to adjust an airline's environmental model in an attempt to reduce emissions. Before a company makes the decision to do so, negative effects have to be outweighed against the positive ones. No studies directly connected with fleet change were

present, therefore, studies connected with the topic of aviation industry in regards to sustainability were chosen (see Table 1).

As highlighted in the previous chapters, over the years, sustainability has become a popular subject. Within aviation, sustainable operations correlate to the fuel prices and policies are crucial within this subject. As this thesis analyses the drivers and barriers (see Figure 3) and also looks into possible sustainable solutions in aviation, studies could be divided into two main directions. Part of the studies, for example, a study by Sonnenschein, Smedby (2019) will be connected with sustainable practices. Others for example, a study by Ritchie, Sie, Gössling, Dwyer (2019) sets to give a better understanding of the key drivers discussed prior to becoming sustainable. Most of the studies are company-level based to better reflect the further work, but some studies are also passenger-based because as previously stated, passengers and their changing needs and awareness play a large part in the key drivers to a company becoming more sustainable.

Table 1

Studies analyzed for empirical part

Author(s), year	Title of the study	Focus
Chao, Agusdinata, DeLaurentis & Stechel 2019	Fleet-level carbon emissions impacts for U.S. airlines.	Best stimulators for companies to use sustainable fuel.
Ritchie, Sie, Gössling, Dwyer 2019	Effects of climate change policies on aviation carbon offsetting: a three-year panel study	Policy implementation and response of society
Sonnenschein, Smedby 2019	Designing air ticket taxes for climate change mitigation: insights from a Swedish valuation study	Possible air ticket tax implementation system
Kim, Lee, Ahn 2019	Innovation towards sustainable technologies: A socio-technical perspective on accelerating transition to aviation biofuel	Biofuel market review, obstacles and possible solutions

Rotondo, Corsi, Giovanelli 2019	The social side of sustainable business models: An explorative analysis of the low-cost airline industry.	Sustainability effects on a company and its financial situation.
Dalmau, Prats 2015	Fuel and time savings by flying continuous cruise climbs. Estimating the benefit pools for maximum range operations.	Possible emission reduction solution for aircrafts: Airbus case study
Graham, Shaw 2008	Low-cost airlines in Europe: Reconciling liberalization and sustainability.	Problems and benefits of becoming sustainable for low-cost airlines.

Source: compiled by author based on studies.

Studies representing sustainable solutions discuss the possibilities of having a more ecological approach to the aviation sector. The first paper chosen for analysis is "Designing air ticket taxes for climate change mitigation: insights from a Swedish valuation study" (Ritchie, Sie, Gössling, Dwyer 2019). The paper discusses the main objectives that should be taken into account if an airline would implement air taxes.

The second study connected to sustainable approach is "Fuel and time savings by flying continuous cruise climbs. Estimating the benefit pools for maximum range operations." (Dalmau, Prats 2015). This study has a more technical approach as it focuses on aircraft systems and flight mechanics in order to save fuel and time by using unconventional methods of flight, in this case a continuous cruise climb. It is also worth noting that the study was conducted using Airbus aircraft. In airBaltic's case, changing from Boeing to Airbus fleet has proven to be effective. The study done by Dalmau and Prats (2015) introduces fuel savings and shorter flight times by flying continuous cruise climbs, meaning that a gradual and constant increase in altitude throughout the flight as the aircraft weight decreases is highly efficient. (Climb Cruise Operations n.d.) As explained by Dalmau and Prats (2015), throughout flight, an aircraft's maximum altitude is limited by the present gross weight of the

aircraft which reduces over time as fuel is burned. This leads to changes in the optimum altitude (AP4ATCO - Factors Affecting Aircraft Performance During Cruise n.d.). airBaltic's new Airbus A220 aircraft have higher cruise altitudes (and overall greater efficiency) than their former Boeing 737 aircraft (A220-300 Purpose built for efficiency n.d.) Therefore, this enables airBaltic to prolong the length of their continuous cruise climbs enabling the savings in time and fuel as analyzed in the study. As this paper uses airBaltic's 'sustainable' solution of a fleet change as the case study, the study done by Dalmau and Prats (2015), correlates with the potential savings this new Airbus fleet is capable of.

Both of the studies are connected with sustainable operations - The former study is based on external solutions and the latter on internal changes. As previously mentioned, the external drivers for change are primarily social views. Therefore, as passengers are crucial for the airlines to operate successfully, the idea that the willingness of a passenger to help the company's drive to improve sustainability is worth looking further into. It is also worth mentioning that passengers are one of the shareholder groups that are contributing to the need of airlines to become more sustainable and therefore their involvement should be considered.

Sonnenschein and Smedy (2019) argue that frequent flyers are the most forthcoming towards paying a tax. They highlight that the main objective is that 70% of participants would be paying to contribute, but the willingness increases for long distance flights rather than for a short distance one. Based on 500 interviews, the authors determined that for developing an effective tax system, characteristics like personal sense of responsibility, political view, as well as preference for tax revenues towards climate change should be considered.

The other direction of the chosen studies is connected with factors that support a company's transformation into a more sustainable model, but the factors that reflect as obstacles also have to be accounted for. In total 4 studies were connected with push and pull

factors, both external and internal. Because of this, there has to be definite reasons as to why a company would want to go the costly way and change their day-to-day operations.

To begin, Chao and others (2019) looked into carbon reduction schemes using sustainable fuel options. The authors found out that there is a positive correlation between GDP growth rate and fuel price. These two are influenced by highly correlated factors: the growing demand for commercial flights influences the prices of the fuel which in turn implies changes in ticket prices which ultimately decreases demand. This goes along with Kim., Lee. & Ahn. (2019) who concluded that the price of the fuel is the biggest concern for airlines and it is one of the links in a highly correlated process chain. In addition, the involvement of the government could be a significant contributor. The authors looked into the social and technical perspective on the transition to bio fuel. By using it, the impact on nature would reduce significantly, but as airlines are companies who are interested in maximizing their profit, the cost of the eco-friendly option is crucial. Unfortunately, biofuel can cost up to five times more than the fuel that is used now based on the facts provided within the study, therefore, it becomes a financially infeasible option. The study concluded that there are however different ways which biofuel could be feasible. One example of this would be the government providing funds in subsidizing the market price of biological fuel, as well as transmitting the charges from the use of fossil fuel to subsidize biological fuel which has proven to be a great success as mentioned in the study. A development of networks is also a step towards a more sustainable future and improved infrastructure is key. The relationship between airlines and governments must also be improved and have a common ground with similar objectives.

Developing biofuel environmental certification is needed in order for the sector to be more transparent. Governments should take into account social aspects when developing

policies and shaping the market demand. Public demand can kick-start the innovation that is crucial for this industry. However, Rotondo, Corsi and Giovanelli (2019) argue that low-cost business models disregard the sustainability, because of the cost associated with it. Meaning, that a part of the existing airlines would not follow the change even if benefits for the environment are substantial. They continue saying low-cost companies tend to look at short-term solutions. Graham and Shaw (2009) go even further and conclude low cost airlines in Europe are not concerned with the effect their operations have on the environment, as their strategy is pro demand, which in turn produces higher emissions. Even so, according to Chao and others (2019) if the costs of facing the emission policy is higher than the implementation of sustainable fuels, the demand of these more environmentally friendly fuels would increase. In turn, this would make airlines more profitable while reducing the level of emissions. They suggest that depending on the policy, it can become too costly to not follow it.

Discussions followed the aftermath shortly after the introduction of the carbon reduction scheme which included the social views on it as explained by Ritchie, Sie, Gossling and Dwyer (2019). These authors conducted a three year study on the effects of climate change policies in Australia (the first country to implement an aviation carbon reduction scheme). They were interested in seeing the possibility of changes in social views of airlines becoming more sustainable. As previously mentioned, one of the external drivers for change is a social one, therefore, as passengers are crucial for airline companies, the willingness of them to help is worth further analyzing. The authors concluded that only 10% of passengers adopt offsets voluntarily. This contradicts the study done by Sonnenschein and Smedy (2019) in Sweden which showed that 70% of people would contribute voluntarily to decrease the effect on the environment. Cultural differences should be taken into account, but this highlights the differences in consumer behavior globally. Ritchie, Sie, Gossling and Dwyer

(2019) displayed heavy emphasis on both knowledge and beliefs about the effectiveness of climate change policies at the global level. In other words, in regards to participation in voluntary offsets, it is more important than it is for national or country specific policies.

The analysis of previous studies, in addition to the theory covered in the previous chapter has expanded the view on the drivers and barriers (see Figure 3). The company has to take into account the drivers and barriers before becoming more environmentally friendly or sustainable. It is worth mentioning that the drivers seem to be of an external nature, but the barriers are connected with the internal factors. The analysis also provides insight into the different methods of becoming less damaging to the environment. Some of these are connected with changes implemented during the flights whereas some focus on the involvement of one of the shareholders, in this case customers. There are several conclusions that can be drawn from these studies and theory. For example, regarding the key drivers for sustainability, international and governmental level policies have significant influence. By looking at which role international and governmental policies have, it can be concluded that different tools are used to offset emission levels. For example, higher airport taxes, taxation on income, and the fee on the level of emissions etc (EEA, 2018). When talking about emission offsetting, it is explained as “reductions in emissions in one place that can be used to compensate for emissions elsewhere” (Emission Offsets n.d.).

These above mentioned factors are the key drivers for a sustainable change, but the biggest difference could be one in which policy is mandatory. Society's beliefs could influence the future profitableness. The policies take economic impact on the company, as they need to change their operations, but the public opinion can influence demand that also could impact their profits. As for the policies including Europe, CORISA and the EU emission trading system is already functioning. The ETS system works by requiring

companies to give up a number of permits (Greenhouse Gas Emissions Permit) that equal the amount of emissions they produce (Aviation in the ETS, n.d.). The effective policy being followed is called CORSIA or the Carbon Offsetting Scheme for International Aviation implemented by the International Civil Aviation Organization. It is argued that it will have the most effective impact compared to any other domestic policy. In the future, CORSIA wants to reach desired CO_2 reductions and control through the use of different tools. One of these tools has already been implemented as of January 2019 - the annual reporting of emissions a carrier produces. There are approximately 80 states that are taking part in CORSIA which implies that results will be effective. (Carbon Offsetting Scheme for International Aviation, 2019) CORISA has already started the annual reporting of emissions per company, but until 2026, offsetting obligations will be influencing flights between participating countries. By 2027, all international flights will partake in this scheme (Teter, Le Feuvre, Gorner, Scheffer 2019).This policy is said to be one of the biggest drivers in emission reduction, but other drivers also have to be acknowledged.

In the theoretical part, the mentioned influence of shareholders such as customers, investors and media, needs to be taken into account as well. As for the main barriers, the costs associated with sustainability are high, the lack of innovation and cooperation between different organizations and other obstacles that are worth mentioning. Whatever the driver is, the need for change is constantly growing.

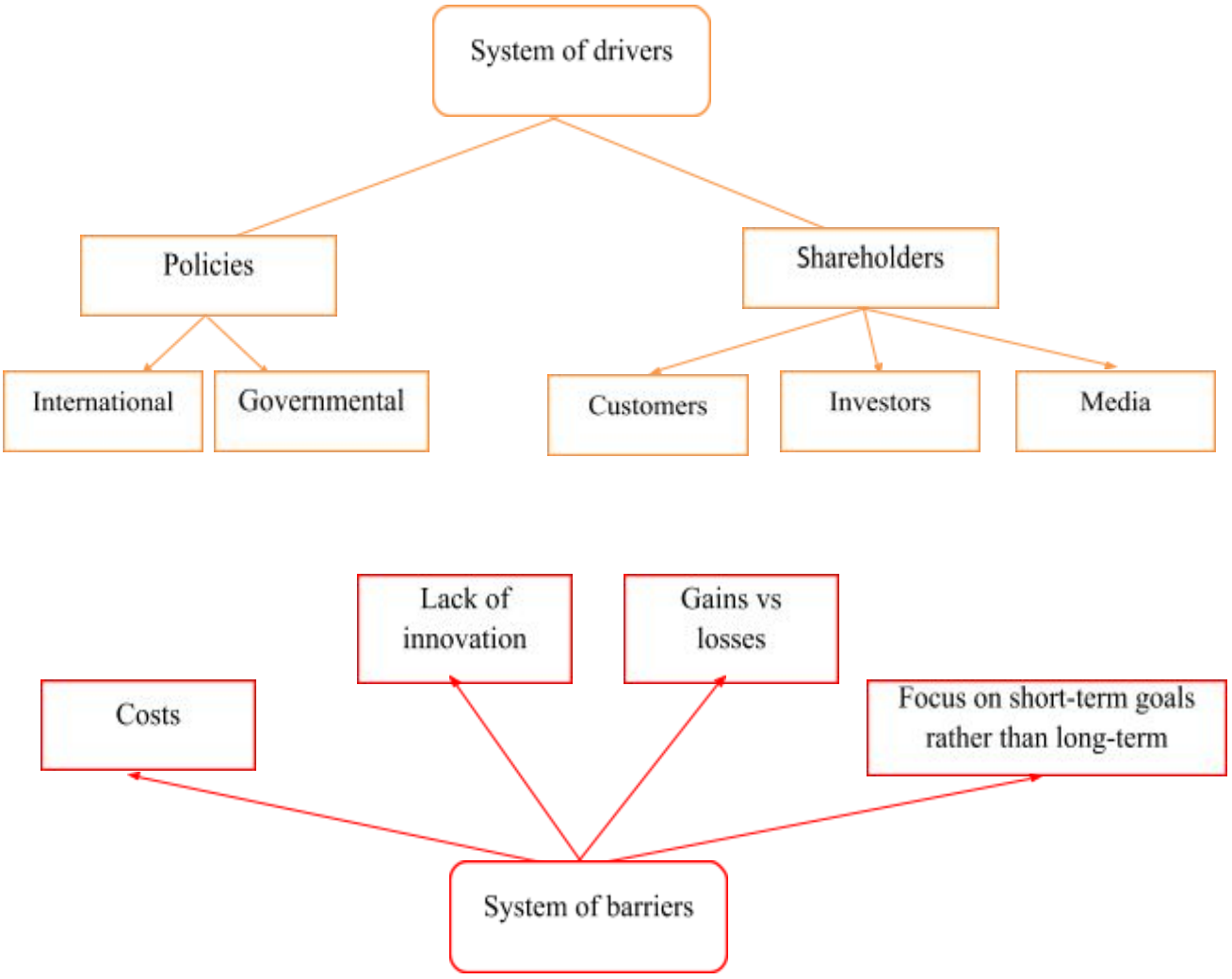

Figure 3

System of drivers and barriers

Complied by the author based on studies done by Ritchie, Sie, Gössling, Dwyer (2019), Sonnenschein, Smedby (2019), Kim, Lee, Ahn (2019), Rotondo, Corsi, Giovanelli (2019), Graham, Shaw (2008), Dalmau, Prats (2015)

Most of the studies used similar methodologies. The most common method was survey and interviews and document and policy analysis (see Table 2). To have a better background of the aviation industry in general, some non-European studies were analyzed.

Table 2

Methodologies used in studies

Author(s), year	Methodology used	Desired outcome
Chao, Agusdinata, DeLaurentis & Stechel 2019	Spearman rank correlation method, Monte-Carlo simulations with stochastic variables	To evaluate importance of variables in each domestic emission policy scenario to the 2050 carbon emissions level, to represent the uncertainty in the economic environment and the domestic emissions scheme design parameters
Ritchie, Sie, Gössling, Dwyer 2019	Extending previous research by including policy factors into a conceptual model, conducting a survey	To assess their knowledge of policies and their beliefs on the effectiveness of global, national and country specific policies and make conclusions of the effectiveness.
Sonnenschein, Smedby 2019	Interview analysis	To determine the willingness to a voluntary tax and the best stimulators for it
Kim, Lee, Ahn 2019	Multi-level perspective framework for analysis of socio-technical transitions	To develop a dynamic pattern to come up with policy suggestions depending on social and technical aspects.
Rotondo, Corsi, Giovanelli 2019	Multiple case study approach	To compare low-cost carriers that operate business models that vary according to social orientations.
Graham, Shaw 2008	Case study analysis, the analysis of relationships between air transport and sustainability	To address the contradictions between air transport liberalization and the economic and environmental effects to sustainability
Dalmau, Prats 2015	Trajectory computation	To reflect the relative importance of the cost of time with respect to fuel costs

Source: compiled by author based on studies.

Multiple considerations need to be taken into account before considering implementing sustainability into the core business: social, economic, supply/demand problems and so on.

2. Drivers and Barriers to Sustainable Aviation, Example of airBaltic.

2.1. Methodology

Two main approaches to better achieve the aim of the paper were chosen – comparison of the emissions prior to and after the fleet change, environmental impact and some economic gains, as well as interviews with airBaltic key specialists regarding sustainability and the key drivers, barriers for it.

To complete the research tasks, the author has used the following data collection and analysis methods. Due to the ongoing Covid-19 situation in the world, it proved a challenge gathering the needed information and data as the aviation world was experiencing an unseen downfall. As mentioned before, the most widely used form of analysis regarding sustainability in aviation is document analysis and interviews. Emission calculation is quantitative/qualitative data that is mostly secondary, but interviews would count as qualitative, primary data.

To further explore airBaltic's sustainable practices analysis of the impact that fleet change has brought to the company has to be conducted. Over the years airBaltic has changed their fleet to newer generation aircrafts. They have highlighted their preferences in the Airbus A220-300 aircraft due to the different characteristics that makes it one of the most sustainable aircrafts in the industry. They also announced a significant decrease in emissions by 33% per passenger kilometer flown compared to 2008. (Think green, fly green n.d.) This approach to sustainability could be described as unique, because the initial investment is very costly, but, even so, analysis of the achieved sustainability results should be provided.

Interviews with specialists in the field were set up. As for the thesis, the company airBaltic is used as an example and the marketing manager was contacted that further sent a list of the most appropriate specialists regarding sustainability in aviation. The initial plan and

contact with the company was made as early as November 2019 and followed up in March 2020.

Due to the circumstances, the initial plan could not proceed and the focus shifted from interviewing employees of airBaltic headquarters to their subsidiary, airBaltic Training Center. Thanks to the help of the marketing manager, it was possible to send out interview questions for the Vice President of Quality Assurance, the captain responsible for Fuel Efficiency within the company, as well as the instructor training future cadet pilots. The interview questions were put together based on meaningful insights from the literature overview, as well as previously done studies and analysis, interview questions were sent through email. The author sent the questions beforehand and these questions were about sustainability in aviation, but as the interviewees were from different positions within the company, the questions were tailored to have the best possible insight about the topic depending on their expertise. As the interview questions differ depending on the interviewees position within the company, some additional questions were added to bring out more detail. Interviewee A questions were based on the decisions and opinion about sustainability within the top levels of management. Interviewee B was asked about the focus on sustainability for the future crew. Finally, Interviewee C (Captain) had additional questions closely aligned with their professional knowledge regarding the technical aspect of sustainability in flight which ties in to previously mentioned studies such as debating the feasibility of continuous cruise-climbs proposed in the Dalmau and Prats (2015) study. As well as the captain has questions regarding the importance of sustainability within daily operations as in airBaltics Annual report, the fuel efficiency approaches have contributed greatly to the emissions reduction. Some questions were identical in order to generalize the answers and make conclusions, but some questions were changed to address the competencies that the other

interviewee does not possess. Interviews followed qualitative research to have meaningful answers. The interview was half-structured and the interviewee was asked to add any meaningful arguments and opinions about questions related to sustainability in aviation. The interviews were set up to follow the theory discussed within the introduction to address the popularity of sustainability in the recent years. The questions were concerned with the interviewee's opinion on sustainability within airBaltic. The author wanted to determine whether the key drivers, as well as the barriers, determined from the previous studies play a key role in the company's decision making. For example, as proposed by Rotondo, Corsi and Giovanelli (2019), the costs are one of the biggest barriers to a company's sustainability. However, Chao and others (2019) mentioned the importance of the government's influence in the proposed policies. Questions about Graham and Shaw's (2008) view that sustainability is more difficult to achieve in low-cost carriers were also asked during the interview to key specialists within the company to observe how closely they align with the views of the study. Questions regarding the future were set up to see if the theory and predictions of international associations go together with the opinion of the interviewees.

2.2. Quantitative and qualitative analysis of sustainability within airBaltic

In the most recent years, airBaltic has been more concerned with sustainability issues. The initiative or the driver for this has been international policies and the company's core beliefs (Annual report 2019, 2019). The company is building their future based upon the Paris Agreement and EU Green Deal. The Paris Agreement is set up to "undertake ambitious efforts to combat climate change" with different member states joining the cause with setting emission offsetting objectives and reporting the results (The Paris Agreement n.d). Sustainable approaches are evident in different levels of the company. These approaches are: reduction of emissions achieved by implementing the new sustainable aircrafts, route

optimization resulting in fuel and expense reduction, usage of different fuel efficiency practices and waste management. The new Airbus A220-300 aircrafts have helped in the emissions and noise reduction, because of the advanced aerodynamics the manufacturer has ensured. (Annual report 2019, 2019) It is evident that airBaltic has many approaches to sustainability, but the most extreme and their opinion significant, is the fleet change to newer, more sustainable aircrafts.

To further analyse if the fleet change has been a significant improvement to the sustainability within the company, calculations prior and after the fleet change were done. The author decided to compare the emissions produced by the fleet in 2010 and 2020. The year 2010 was chosen because this year provided the possibility to compare a diverse fleet while 2020 was a year with more of a shift and focus towards phasing out other types of aircrafts to only have Airbus A220s (still in progress). The fleet now consists mostly of Airbus aircraft so it is possible to see the differences in emissions produced by a change in fleet type and conclude whether or not this is beneficial and why. In the author's findings, by changing the fleet, airBaltic has in fact reduced their carbon footprint. There are a few points to note how these calculations were made.

First it is important to determine the composition of the fleet in 2010 and 2020. By searching through airline-provided information and industry reports, it can be concluded that the fleet consisted of 35 aircrafts in 2010 and 37 in 2020 (see Appendix A). Worth to mention that there are different methods when it comes to calculating the emissions of a flight. On the website of the International Civil Aviation Organization (ICAO), a carbon emission calculator can be found. This calculator enables a user to input certain data such as flight routes and the number of passengers onboard. The calculator then uses an average fuel burn given the weight of the aircraft along with time-distance calculations to determine the

emissions value. While this data is primary and useful for one to see roughly how much of a carbon footprint they create during a flight (per passenger), the outcome is generalized and often overestimated as the calculations are based on a wide range of aircraft types (312) and industry averages. Therefore, this method and its results are rather misleading towards the paper's objectives, but can be seen as rather interesting information for the passengers who are curious (ICAO Carbon Emissions Calculator Methodology 2017). In other words, the calculator's results are not beneficial to the paper as it is impossible to input the exact fleet and portray airBaltic's flight conditions within the calculator. The calculator would also not give accurate results as it is also impossible to compare the various routes and conditions that existed in 2010 as this calculator uses recent industry averages. To provide an example of how different the aircrafts are, the author provided data (see Appendix B) on various aircraft types and their specifications to portray their differences and how an 'average' of these as used by the ICAO emissions calculator could skew results.

It was important to find a method that takes into account the specific type of aircraft when providing data for emissions. One useful method used by the Climate Registry takes into account each aircraft type's specific emissions data by actually calculating the emissions during flights themselves. There is significant reasoning why this method was considered to be most effective as it provides an estimate of emissions produced in 2010 and 2020 (see Appendix C). Climate Registry has calculated emissions by proposing the term for the Landing Take Off (LTO) cycle for a typical aircraft. Aircraft operations (and emissions) are divided into two main parts: The LTO cycle and cruise.

The LTO cycle takes into account all the activities below an altitude of 1000 meters (taxi, take-off, climb, approach-landing), but cruise takes in account all the activities above 1000 meters (Rypdal 2000). The Climate Registry made their calculations based on the

number of LTO cycles which correlates with aircraft/engine type and provided information for emissions of aircraft type also used by airBaltic (Waldron & others 2006). To give an accurate estimate on the decrease of emissions of airBaltic's fleet over the years based on the fleet change, the author has made calculations with the assumption that every aircraft in the whole fleet operated one flight on a single day. In other words, every aircraft in the fleet performed one LTO.

To move further and show the difference of emissions in the years 2010 and 2020, the number of each type of airBaltic fleet (see Appendix A) aircraft will be multiplied by the factors proposed by Climate Registry (see Appendix C), In 2010 airBaltic fleet had 4 types of aircraft, totalling to a fleet of 35. The total amount (kg) of emission in the LTO cycle (see Table 3) was 74,920 in one day. The largest amount of emissions were produced by the Boeing 737. The smallest amount was produced by Dash 8 Q400 at 5,180 . In 2020, the airBaltic fleet was measured as having three types of different aircraft, totalling to 37 in the fleet. The total amount (kg) of emission produced in the LTO cycle was 58,768 in one day. The largest amount of emissions were produced by Airbus A220-300 as they have 22 aircrafts and the smallest amount was for the Boeing 737 as they have only three of them left in the fleet. Even though this is an estimation of the emissions produced in a particular cycle, the calculations show the improvement over the years done by the fleet change. In 2010 airBaltic had a smaller total of aircraft in the fleet, but the level of emissions were still higher than in 2020 with a larger fleet (additional two aircrafts). It is worth mentioning that in addition to CO_2 reduction, Airbus manufacturers claim the aircrafts have a significant decrease in the NO_x levels, 50% lower than the (CAEP/6) standards which is an additional benefit to the environment and sustainability (A220-300 Purpose built for efficiency n.d.).

The most recent NO_X standard is 15 g from 1 kg of fuel and Airbus is said to have 50% reduction in this (Dickson 2014).

Table 3

Total LTO emission depending on the composition of fleet in 2010 and 2020

2010			2020		
Aircraft type	Number of aircrafts	Total LTO emissions (kg)	Aircraft type	Number of aircrafts	Total LTO emissions (kg)
Fokker F50 / F60	10	23 900	Airbus A220-300	22	43 648
Boeing 737-500	15	37 200	Boeing 737-500	3	7 440
DHC-8 Dash 8	8	5 180	DHC-8 Dash 8	12	7 680
Boeing 757-200	2	8 640			

Source: authors calculations

It is evident that airlines have taken sustainability seriously and this has resulted in a meaningful improvement in reduction of emission, at least in airBaltic's case. By the year 2022, airBaltic plans to have a 100% Airbus A220 fleet totalling to 50 aircraft further portraying airBaltic's drive to reduce aircraft emissions (airBaltic receives its 22nd Airbus A220-300 2019).

For further emphasis on the positive impact of fleet change in favor of Airbus aircrafts, approximate calculations can be made using the same variables. In the year 2022 by having 50 Airbus aircrafts, the emissions would be 99,200kg. By following the logic of previous calculations, 2020 emissions in a given day were 58,768 kg of CO2. Dividing this by the 1,984 kg figure of the emissions for Airbus A220 gives 29 of the aircraft. In conclusion, rather than having a mixed fleet in 2020, airBaltic would have benefited more by having a fleet of 29 A220s with the associated reduced emissions and costs of having a smaller single-type fleet. In addition, according to the manufacturer, the fuel consumption is 20% less than the previous generation aircrafts. For example, Boeing 747 burns 12 liters of fuel per kilometer, naturally, the total fuel consumption depends on the actual route flown, but even so, 20% less fuel results in less money spent (How much fuel does an international plane use for a trip? N.d.) . It is worth mentioning the operational costs are reduced by having a simplified supply chain (Dicher, Riedel, Ritter & Saxon 2018). As mentioned in the theoretical part, buying new aircrafts would be extremely costly, but by choosing a different approach such as leasing, the costs can be divided and therefore, be more reasonable. The environmental benefit proven by the calculations as well as supported by the statements made by the manufacturer are significant and can support the reasoning that this change has helped reduce the carbon footprint substantially. Ultimately, this practice can be seen as an example that brings environmental benefits and economic benefits in the long term.

To proceed with the research and conclude what the situation is within airBaltic regarding sustainability, interviews with key specialists were conducted (see Table 4).

Table 4

Interviews with airBaltic employees

Interviewees	Sector, department	Occupation	Medium
Interviewee A	Compliance & Safety	Airline safety management, quality assurance, process efficiency	Phone
Interviewee B	Training Center	Pilot Instructor	E-mail
Interviewee C	Flight Crew	Captain, Fuel Efficiency	E-mail

Source: compiled by author

Interview A (See Appendix D) was sent to the Quality Assurance specialist. The next interview (see Appendix E) was conducted with an instructor at the airBaltic Training Center and the author wanted to understand the importance of sustainability when it comes to the teaching process of future pilots. The final interview (see Appendix F) was conducted with an airBaltic captain to understand how the practical and theoretical aspect of sustainability come together within the airline.

In the theoretical section, several drivers and barriers of sustainability were highlighted. Key drivers included policies (international, governmental) and shareholders (media, customers, investors). The main barriers were costs, lack of innovation, short term goals and absence of benefits. The interviewees were then asked to rate these factors by importance and add additional insights which were crucial for airBaltic. As for the main driver and barrier, opinions differed.

One of the specialists (interviewee B) emphasized policies as the main driver a company can have and costs as the main barrier. The costs associated with sustainability is a negative but necessary step.

"*Environmental sustainability is the next step towards which all airlines will have to move thus increasing costs as many times being environmentally friendly increases costs as for today*" (…) (B)

Another specialist (Interviewee C) put emphasis on pressure from the public sphere and absence of clear goals as the biggest issue for the company. While the third specialist (Interviewee A) put emphasis on customers and investors being the biggest driver as they are the main force that keeps the company working. The policies are a far more abstract driver, because they provide the needed guidelines, but no actual action plan. Therefore, sustainable reporting and interest shown by investors is the biggest driver that keeps the company sustainable.

Differences in opinion regarding the drivers and barriers could be due to the fact that the interviewees are from different levels within the company, therefore their involvement regarding sustainability, differs.

The Quality Assurance specialist (Interviewee A) shared that corporate clients had recently become more environmentally interested in what the airline was doing. To deal with this pressure, immense investments were made by acquiring modern aircrafts and other sustainable practices were started.

While interviewing the Quality Assurance specialist, he explained that different tools were being utilized by airBaltic. For example, corporate reporting, changes in catering during flights, flight data monitoring, as well as simple, but effective procedures such as having a precise cleaning schedule of the aircrafts in order for the surface to be as aerodynamic as possible. Corporate reporting is a way for a company to become more transparent in their annual reporting, while changes in catering are focusing on using sustainable materials in the in-flight operations. The Flight Data Monitoring provided the most insight into drivers and barriers, however.

Flight Data Monitoring (FDM) involves the recording of all in-flight related activities as explained by the Quality Assurance Specialist (Interviewee A). This is used for accident

investigations and to record and statistically organize data such as habits pilots may have during routine flights like common mistakes and errors. However FDM has also found its use in monitoring how well a pilot flies and potentially saves fuel, including following noise-abatement procedures such as how often reverse-thrust during landings is used which can be loud and disturb the surrounding environment. This can be considered a driver for the environment as the use of FDM has refined the noise-abatement procedures. Another example of how FDM has been a driver has been airBaltic's increased usage of single-engine taxiing after landing where possible as this saves a small amount of fuel every flight. In other words, FDM has highlighted certain aspects of standard operating procedures which have become more environmentally friendly due to the usage of this system. With that being said, this can be considered an economical driver but also a technological driver in an attempt to be more environmentally friendly.

The choice to transition the airBaltic fleet with newer and sustainable aircraft was greatly supported. The environmental benefit, as well as the economic benefits in form of cost saving due to reduction of fuel usage and operation costs goes in line with the previous findings supporting the fleet transition. Interview A brought out insights that even by having full, sold out flights, the emissions per kilometer reduce, so the airline has to do everything in order to gain more customers. By being sustainable and having modern aircrafts, the airline is able to have a competitive advantage.

Two of the specialists (Interviewee B, Interviewee C) remarked the need for more easily achievable sustainable approaches such as: reusable cups, reduction of plastic and paper in flights and reduction of food waste. The main logic behind this statement was that these practices are tangible and relatable to the customer. The study done by Hagmann, Semeijn & Vellenga (2015) puts emphasis on the lack of transparency in aviation related to

environmental efforts. They continue by highlighting the problems related to the average customer not being to see the actual environmental efforts done in the airline industry due to the lack of specific technical knowledge related to aviation which goes in hand with the opinion of specialists in airBaltic. The fleet transition is the biggest tool in an attempt to reduce the emissions in airBaltic, but the customer often does not perceive these slow changes nor do they see the inside workings or statistics of a company.

An additional barrier in the form of competitors who disregard sustainability and invest funds elsewhere was also proposed by one of the interviewees (Interviewee B). This goes in line and contradicts opinion of Quality Assurance specialist (Interviewee A), he disregards the results proposed in study done Graham and Shaw (2009) concluding that low-cost carriers are not concerned with sustainability:

"*It is equally important to every air carrier that is operating on an economical basis. Sustainability is the driver, being sustainable is not only better for the environment, but better for business, it is a business necessity nowadays*" (…) (A)

Low-cost carriers have more funds, because they offer cheaper tickets and in this way they are able to fill their flights and bring the costs per flight down to minimum, a lot of airlines can't compete with these numbers, but they are able to compete in regards to sustainability.

Regarding the importance of sustainability in the airline, it is not seen as the top priority. With safety being the main concern, sustainability issues are not felt as imminent threats, but as something to strive for in the company. While asking about the feasibility of continuous cruise-climbs proposed in the Dalmau and Prats (2015) study, Captain (Interviewee C) mentioned that this approach is not very pragmatic by stating that:

"*a flight is a coordination process of many entities (weather, ATC, airspace users, airports)*" (…) (C)

This approach has not been tested yet, but the reason behind it could be the lack of innovation and leadership to try approaches like this.

Sustainability as a trend has gained its popularity recently and so questions regarding changes in favor of sustainability within the teaching methods for future pilots was also asked. There were some similarities, but different arguments behind the answers as one interviewee (C) completely disregarded emphasis on sustainability in the teaching methods as they interpreted this issue as not being important but the other specialist (Interviewee B) disregarded this aspect as the pilots can't influence this, because it all depends on the type of aircraft the pilot is operating.

The importance and growing trend of sustainability within the airline was acknowledged by all the interviewees. The need for sustainability was not only something customers felt needed improvement but employees too. It has made the subject all that more important. The role employees play in the sustainability within the company is discussed in several studies such as the study done by Islam, Islam, Pervez & Nabi (2019) which concluded that green practices in the company's structure will help to focus on the key resource: people of the organization and they in turn "will help to achieve the green business goals and objectives through their loyal participation". This can be added as an additional driver, additional shareholder.

From the information gathered, the overall impression from the key specialists in airBaltic can be summarized by stating that the company is endeavoring to be sustainable and the changes made in the recent years support this. The company is focusing more on sustainable approaches, but additional assistance in the form of clear leadership to pursue this

issue more is needed. While analyzing the interviews, additional key drivers within airBaltic surfaced. Outside pressure from customers and investors, as well as additional pressure from employees and technological advancements are key drivers for airBaltic.

In conclusion, the information gathered from the interviews points towards the biggest barrier being connected with costs which also ties in with the same conclusions the studies analyzed in the theoretical part held. However, the interviews also pointed to varying opinions between the specialists from different departments. They all shared the opinion that while costs were the biggest barrier, the absence of clear goals is stagnating improvements in becoming more sustainable which can be also expressed as a social barrier. In this case, as mentioned before, a designated leader with clear goals could be considered in order to bring in a driver for improvement.

Conclusion

In this research, the author looked at the key drivers and barriers to sustainable aviation, using airBaltic as a case study.

To achieve the aim of the research, a theoretical framework of sustainable practices within aviation was set, based upon available literature. To understand why companies need to be sustainable, the environmental and social effects of the aviation industry are clear - The emission quantity and growing popularity of air transportation had a negative impact on the environment. But the biggest concern to businesses was understanding why a company would want to change their operations and choose the potentially more costly method to improve sustainability. By continuing with the analysis of previous studies, four out of seven were contributing to the key drivers for sustainable businesses and three were focusing more on the sustainable options for airlines.

When looking at studies done by researchers, it was concluded that the biggest driver for sustainability were governmental policies. However, the biggest obstacles, or barriers, would be the costs and lack of innovation in regards to sustainable practices along with the missing connection between the main organizations that could make the change for companies easier and more cost-effective.

In the empirical part, interviews with key specialists and calculation of emissions before and after the fleet change was conducted. The interviews brought out different opinions about the sustainability situation within airBaltic. Additional key drivers and barriers were brought out. Extra pressure from employees and technological advancements are an additional key driver for airBaltic. Barriers are connected with costs that go in hand with the analyzed theory, but additional obstacles in form of lack of leadership and clear goals were brought up.

Fleet change has so far shown to be the best solution to tackle sustainability issues within the company, as the environmental and economic gains are significant. However, more work can be done such as improvement towards customer attention oriented approaches which could potentially benefit the company.

The main drivers were the governmental policies and pressure from the public, but the biggest barrier was the costs associated with sustainability. Most of the answers received from the interviewees coincide with the theory mentioned in the research. Additional insights as to how employees benefit the cause were supported by different studies. The calculations brought out the significant environmental and economic benefits that airBaltic's sustainable approach is bringing to the company. By having new and modern aircrafts, the company reduced their environmental footprint by having a direct supplier which ultimately brought down the costs of maintaining the fleet. The fleet change has proven to be a radical but justified choice in becoming a more sustainable airline.

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Appendices

Appendix A

AirBaltic fleet in 2010

2010		2020	
Aircraft type	Number of aircrafts	Aircraft type	Number of aircrafts
Fokker F50 / F60	10	Airbus A220-300	22
Boeing 737-500	15	Boeing 737-500	3
DHC-8 Dash 8	8	DHC-8 Dash 8	12
Boeing 757-200	2		

Source: Airfleets, Planespotters (n.d.)

Appendix B

Various aircraft type specifications

Aircraft type	Cruise Speed	Range	Max altitude	Max number of passengers
Airbus A220-300	828 km/h	11 482 km	12 496 km	141

Boeing 737-500	911 km/h	5 463 km	11 227 km	132
DHC-8 Dash 8	667 km/h	2 040 km	7620 km	90
Fokker F50 / F60	454 km/h	2 056 km	7620 km	58
Boeing 757-200	918 km/h	7 251 km	12 801 km	239

Source: aicraftcompare (n.d.)

Appendix C

LTO cycle is a useful way of standardizing emissions as most aircraft will fly the same departures and approaches along with the same taxi routes around an airport. In other words, anything beyond 1000 meters is considered too vague to analyze; the author selected the LTO cycle as the cruise cycle had too many dependents (mass, distance, altitude, speed, wind) and vastly differ by the aircraft type, even within the types themselves (AP4ATCO - Factors Affecting Aircraft Performance During Cruise n.d.).

LTO is widely used when calculating the emissions, it is a reference for technology comparisons as in the paper's case with airBaltic fleet change (ICAO Environment Branch 2013). In addition, while reporting local air quality and emission standards, the International Civil Aviation Organization is concerned with the emissions produced under approximately 1000 meters (Dickson 2014). The LTO cycle information detailed in the Climate Registry

provided data which was used as an accurate estimate of emissions per aircraft type in airBaltic's fleet between 2010 and 2020 (see Table).

Table

Factors for Calculating LTO Emissions

Aircraft type	CO_2 (kg / LTO)
Boeing 737-500	2480
DHC-8 Dash 8	640
Fokker F50 / F60	2390
Boeing 757-200	4320
Airbus A220-300	1984*

Source: Climate Registry (2018)

*As the Boeing 737-500 is a single aisle aircraft, calculations for Airbus A220-300 were made by deducting 20% of Boeing emissions as this is considered the same class aircraft.

As Airbus A220-300 is considered to be a newer model of the series, the data for their emissions was not available in the Climate Registry Table but this was a key information necessary in determining emissions within airBaltic's fleet. Therefore, the author created their own accurate estimate of carbon emissions for the Airbus' A220-300 using the aircraft specifications provided by the manufacturer. In this case, the A220-300 has a 20% reduction in CO_2 emissions compared to other aircraft of the same class such as airBaltic's own fleet of 737-300s (A220-300 Purpose built for efficiency n.d.).

Appendix D

Interview for Quality Assurance specialist

1. In the aviation industry, do you think sustainability is a growing trend? Why so?
2. In your opinion, would you consider airBaltic an airline that thrives to be sustainable? Why so?

3. Please describe the importance of sustainability in an airline company? Would you agree that it is less important for low-cost airlines?
4. How would you describe airBaltic sustainability in regards to their competitors?
5. What do you consider to be the most sustainable implementation in the company?
6. How do you agree with the statement that fleet change from Boeing and Dash to Airbus is environmentally friendly and why?
7. Could you rate the following statements in the order from biggest drivers to lowest drivers in regards to sustainability? Do you think there are other drivers not mentioned and if yes, what are these drivers?
8. (International policies, governmental policies, pressure from society, pressure from social media, pressure from stakeholders)
9. Could you rate the following statements in the order from biggest barriers to lowest barriers in regards to sustainability? Do you think there are other barriers not mentioned and if yes, what are these barriers? (Costs associated with sustainability, lack of innovation regarding sustainability, short term goal oriented view, lack of gains vs losses)
10. What part does the government play for the airline to become more sustainable? Do you think the present situation is efficient enough?
11. Would you agree that sustainable fuel is the most expensive option and that the industry has to change a lot in order for the fuel to be feasible enough for air carriers?
12. What can the company do to be more sustainable?

Appendix E

Interview for the Instructor

1. In the aviation industry, do you think sustainability is a growing trend? Why so?
2. In your opinion, would you consider airBaltic an airline that thrives to be sustainable? Why so?
3. Please describe the importance of sustainability in regarding the teaching methods for future pilots?
4. Would you agree that sustainable aviation will have a bigger impact on the theoretical knowledge for pilots in the future? Why so?
5. How do you agree with the statement that fleet change from Boeing and Dash to Airbus is environmentally friendly and why?
6. Technically, does the Airbus have less of an environmental impact than the other aircrafts used in airBaltic? How?
7. Could you rate the following statements in the order from biggest drivers to lowest drivers in regards to sustainability? Do you think there are other drivers not mentioned and if yes, what are these drivers?
8. (International policies, governmental policies, pressure from society, pressure from social media, pressure from stakeholders)
9. Could you rate the following statements in the order from biggest barriers to lowest barriers in regards to sustainability? Do you think there are other barriers not mentioned

and if yes, what are these barriers? (Costs associated with sustainability, lack of innovation regarding sustainability, short term goal oriented view, lack of gains vs losses)

10. What can the company do to be more sustainable?

Appendix F

Interview for the Captain

1. In the aviation industry, do you think sustainability is a growing trend? Why so?
2. In your opinion, would you consider airBaltic an airline that thrives to be sustainable? Why so?
3. Do you think fuel savings and shorter flight times could be achieved by flying continuous cruise climbs? How realistic could this be?
4. Please describe the importance of sustainability within daily operations?
5. Is sustainability felt as a pressure from the company?
6. Would you agree that sustainable aviation will have a bigger impact on the theoretical knowledge for pilots in the future? Why so?
7. What can the company do to be more sustainable?

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